User manual

ADA-4028L
RS-485 to Current Loop 2-wire CLO Converter

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1. GENERAL INFORMATION

Thank you for your purchase of **CEL-MAR Company** product. This product has been completely tested and is covered by a two year warranty on parts and operation from date of sale.
If any questions or problems arise during installation or use of this product, please do not hesitate to contact Technical Support at +48 41 362-12-46.

1.1. WARRANTED INFORMATION

The **ADA-4028L** converter is covered by a two year warranty from date of sale. The warranty does not cover damage caused from improper use, materials consumption or any unauthorized changes. If the product does not function (is damaged), or not operate in accordance with the instructions will be repaired.
All warranty and no warranty repairs must be returned with paid transport and insuring to the **CEL-MAR Company.**
CEL-MAR Company under no circumstances won't be responsible for ensuing damage from improper using the product or as a result of random causes: the lightning discharge, the flood, the fire and the like.
CEL-MAR Company is not be held responsible for damages and loss including: loss of profits, loss of data, pecuniary losses ensuing from using or the impossibility of using this product.
In specific cases CEL-MAR Company discontinue all warranties and in particular do not follow the user manual and do not accept terms of warranty by the user.

1.2. GENERAL CONDITIONS FOR SAFE USE

The device should be installed in a safe and stable places (eg, electroinstallation cabinet), the powering cable should be arranged so as not to be exposed to trampling, attaching, or pulling out of the circuit.
Do not put device on the wet surface.
Do not connect devices for nondescript powering sources,
Do not damage or crush powering wires.
Do not make connection with wet hands.
Do not adapt, open or make holes in casings of the device!
Do not immerse device in water or no other liquid.
Do not put the fire opened on device sources: candles, an oil lamps and the like.
Complete disable from the supply network is only after disconnecting the power supply circuit voltage.
Do not carry out the assembly or dis-assembly of the device if it is enabled. This may result to short circuit and damage the device.

1.3. CE LABEL

CE symbol on organizing the company CEL-MAR a conformity of the device to the directive of the electromagnetic EMC 2004/108/WE compatibility means (Electromagnetic Compatibility Directive). The declaration of the agreement is accessible through the contact with the technical service at the address e-mail: serwis@cel-mar.pl or on the phone at the +48 41 362-12-46.

1.4. ENVIRONMENTAL PRESERVATION

This sign on the device inform about putting expended device with other waste materials. Device should send to the recycling. (In accordance with the act about the Electronic Appliance Expended from day 29 of July 2005)

1.5. SERVICE AND MAINTENANCE

The ADA-4028L converter does not require the servicing and maintenance.
Technical support is available at number +48 41 362-12-46 in 8.00-16.00, from Monday to Friday or e-mail support@cel-mar.pl.

2. PRODUCT INFORMATION

The converter is delivered with User Manual and resistors: Rd 220Ω / 0,25W (1pcs.) i 120Ω / 0,25W (1pcs.).

2.1. PROPERTIES

- Operating on 2-wire network in Current Loop standard,
- Operating 2 or 4 wire network in RS485 standard,
- Possibility of connection up to 4 devices with passive transmitter on Current Loop CLO network,
- Possibility of connection up to 32 devices on RS485 network,
- Baud rate up to 19,2 kbps,
- Transparent for all protocols: MODBUS, DNP, PROFIBUS and other,
- Power supply 10 - 30 VDC stable,
- 2,5kV= optoizolation in signal channel between RS485 and Current Loop interface,
- 1kV= or 3kV= galvanic isolation between RS485 interface and power supply,
- 1kV= or 3kV= galvanic isolation between Current Loop interface and power supply,
- Connection RS485 network and power supply via screw terminal block,
- Connection Current Loop network via screw terminal block,
- Implemented short circuit protection and over-voltage protection on the level 600W on RS485 network,
- Implemented short circuit protection and over-voltage protection on the level 600W on Current Loop network,
- Protection against power supply reverse connection,
- DIN 43880 standard - mounting in typical electro-installation unit,
- Rail mounting according to DIN35 / TS35 standard,
- Dimensions (W x D x H) 53mm x 58mm x 90mm.

2.2. DESCRIPTION

The converter ADA-4028L is produced with active or passive Current Loop transmitter.
ADA-4028L with active transmitter allows to connect to RS485 Bus devices with passive interface of Current Loop (CLO) eg. energy meter LZQM type, without interfering with the data format.
Connecting two ADA-4028L converters together (via Current Loop interfaces), one with passive transmitter and second with active transmitters, allows extension of RS485 bus by the use of 2-wire Current Loop.
ADA-4028L transmits data at baud rate up to 19,2 kbps, through one or two twisted-pair on the side of RS485 interface and one twisted-pair on the Current Loop side. The converter is equipped with screw terminal block for connection of RS485, CLO and power supply. Uses only the following signals:

a) RX+,RX-,TX+/A,TX-/B – for RS485 interface,
b) CLO+, CLO-, Rd - for active Current Loop interface,
c) CLO+, CLOR+ (connecting of CLO+ thought resistor R=1000Ω, Fig.10), CLO-, Rd - for passive Current Loop interface.

Over-voltage protection on each RS485 line and Current Loop, was made on the base 600W over-voltage LED's and the fuses.
To RS485 bus created by the use ADA-4028L, it is possible to connect 32 devices , operating in half duplex mode (query /response) on 2 or 4 wires multipoint bus. To Current Loop bus it is possible to connect up to 4 devices with passive CLO interface, operating in half duplex mode.

The converter has an internal low-energy surge protection for each line of Current Loop interface. However, for the lightning protection should be used external lightning arresters such as the typical phone line protection.

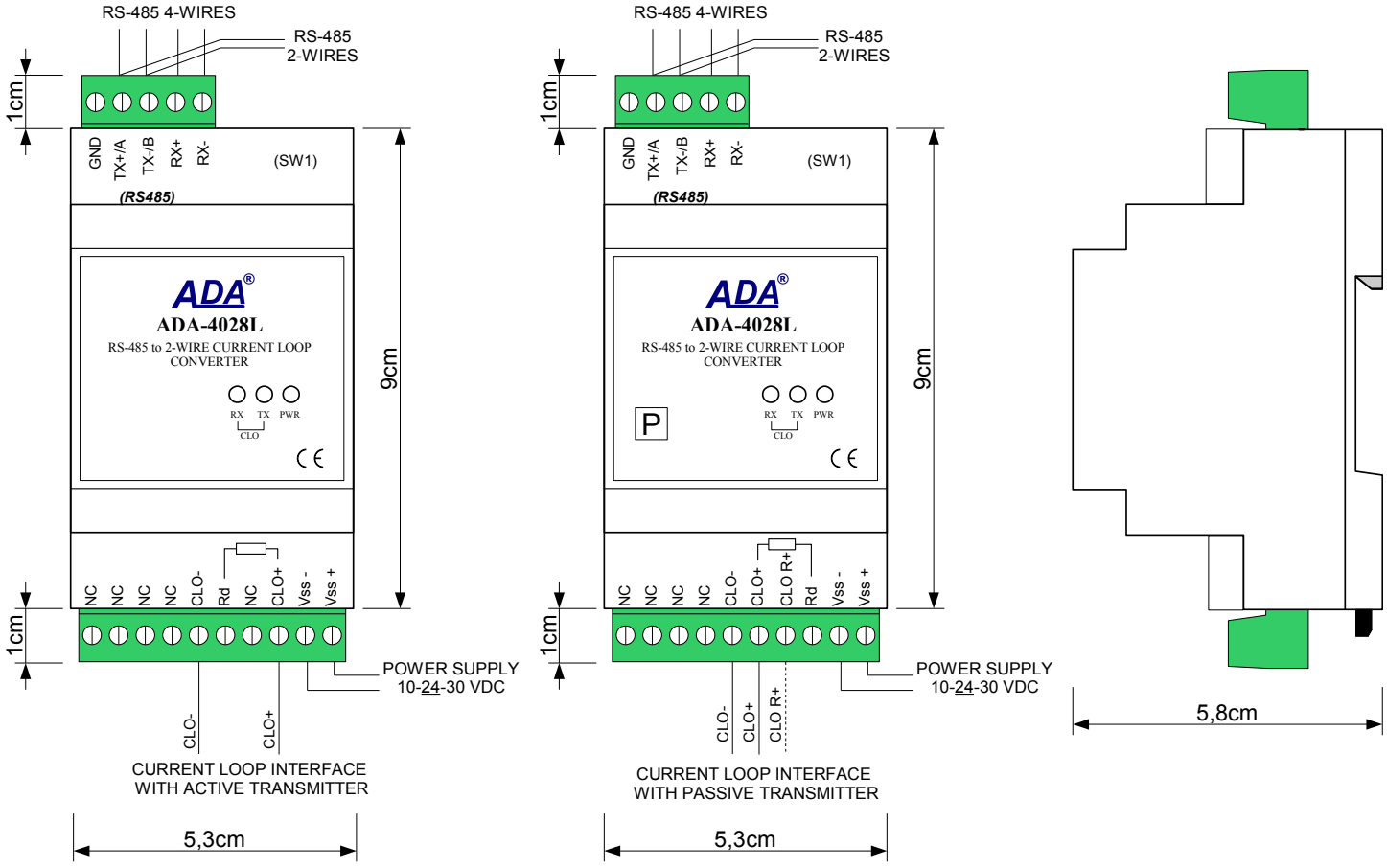

Fig 1. View of ADA-4028L with active and passive Current Loop interface

2.3. CURRENT LOOP TRANSMITTER & RECEIVER

The converter ADA-4028L is produced with active or passive Current Loop transmitter.
The converter with CLO active transmitter has the transmitter on base power source generating the 0-20mA and passive receiver comprising the optocoupler. ADA-4028L with CLO passive transmitter has the transmitter on base power source generating the 20mA and passive receiver comprising the optocoupler.

2.4. ISOLATION

Converter ADA-4028L has 3-way, 1kV= or 3kV= galvanic isolation (depend on version). The converter versions are described in section VERSIONS.

3-WAY ISOLATION

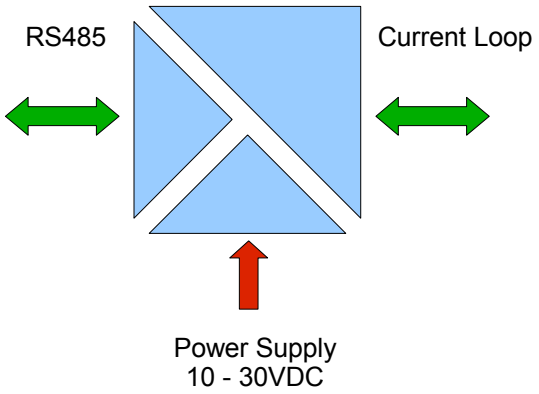

Fig 2. Isolation diagram

3. INSTALLATION

This chapter will show how to connect ADA-4028L to RS485 bus, Current Loop CLO line and power supply and how to use it.
To reduce disturbance from environment, it is recommended to:

- use multipair type shielded cables, which shield can be connected to the earthing on one end of the cable,
- use the suitable diameter cable for power supply on account of voltage drop,
- use the powering cable with a suitable section because of the voltage drops,
- use the interference eliminators for powering the converter,
- lay signal cables at a distance of not less than 25 cm away from power cables,
- not powering the converters form the power-circuit of devices generate large impulse disturbance like contactors, relays, inverters.

3.1. ASSEMBLING

ADA-4028L converter case is adapted to assembly on TS-35 (DIN35) rail. To install converter should mount device on the rail upper part of the case then press bottom part to to hearing characteristic „Click” sound.

3.2. CONNECTION TO RS485/RS422 BUS

RS485/RS422 interface at ADA-4028L converter is available on terminal block described as: Tx+/A, Tx-/B, Rx+, Rx-. ADA-4028L support operating on RS422 bus and RS485 (2-wire and 4-wire). Both buses need proper cabling.

3.2.1. POINT-TO-POINT CONNECTION OF RS422 OR RS485 (4W) DEVICE

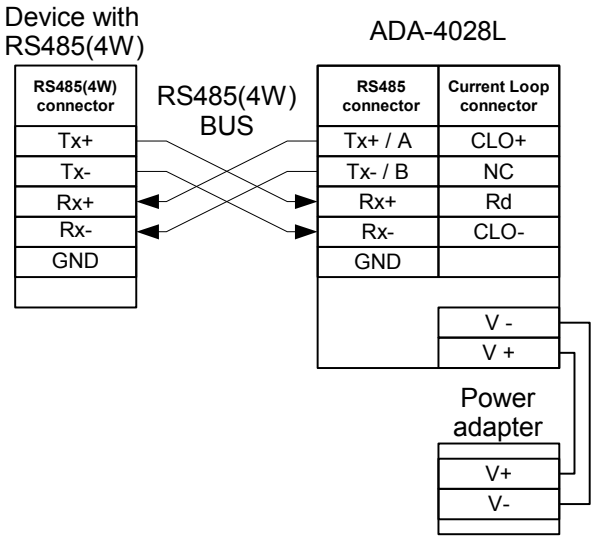

Fig 3. Example connection of RS422 or RS485(4W) device to ADA-4028L converter

3.2.2. POINT-TO-POINT CONNECTION OF RS485 (2W) DEVICE

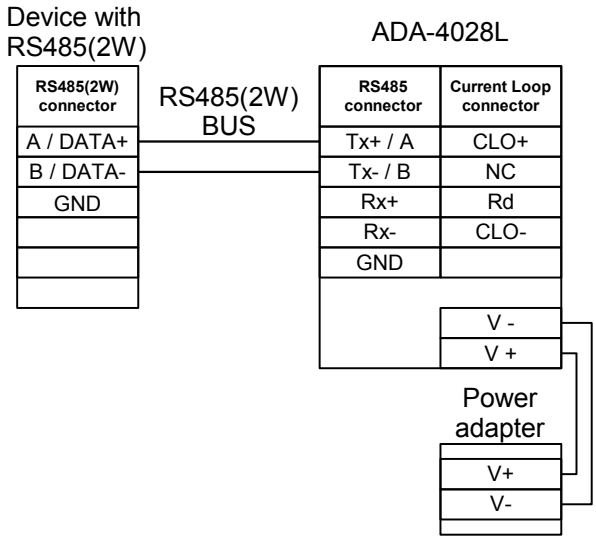

Fig 4. Example connection of RS485(2W) device to ADA-4028L converter

3.2.3. CONNECTION TO RS485 (4-WIRE) BUS

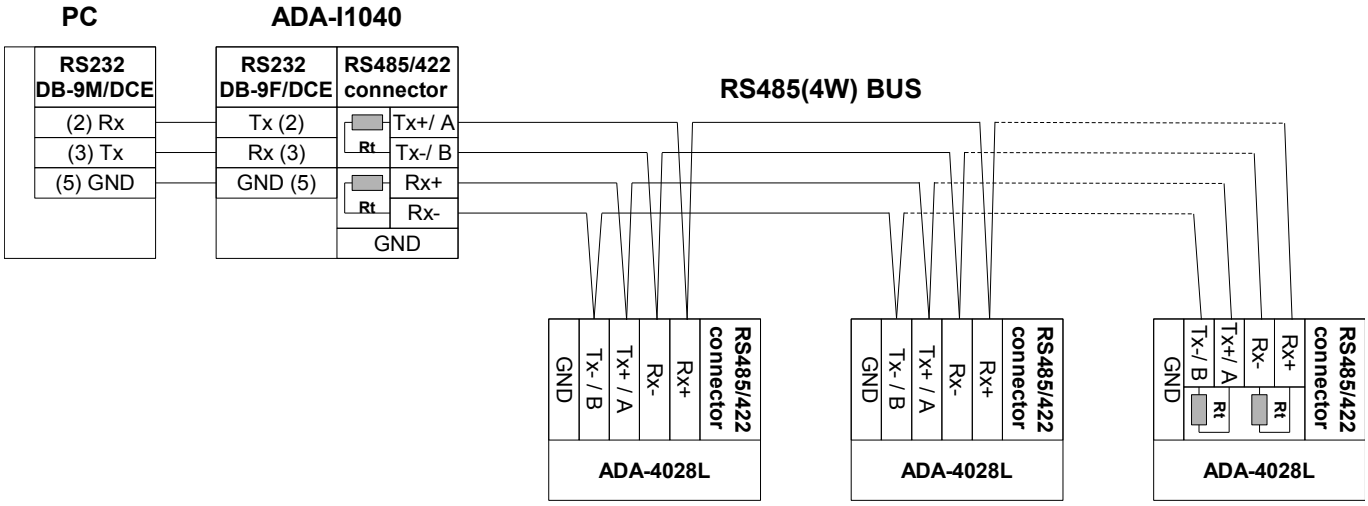

Fig 5. Example connection of ADA-4028L to RS485(4W) Bus

3.2.4. CONNECTION TO RS485 (2-WIRE) BUS

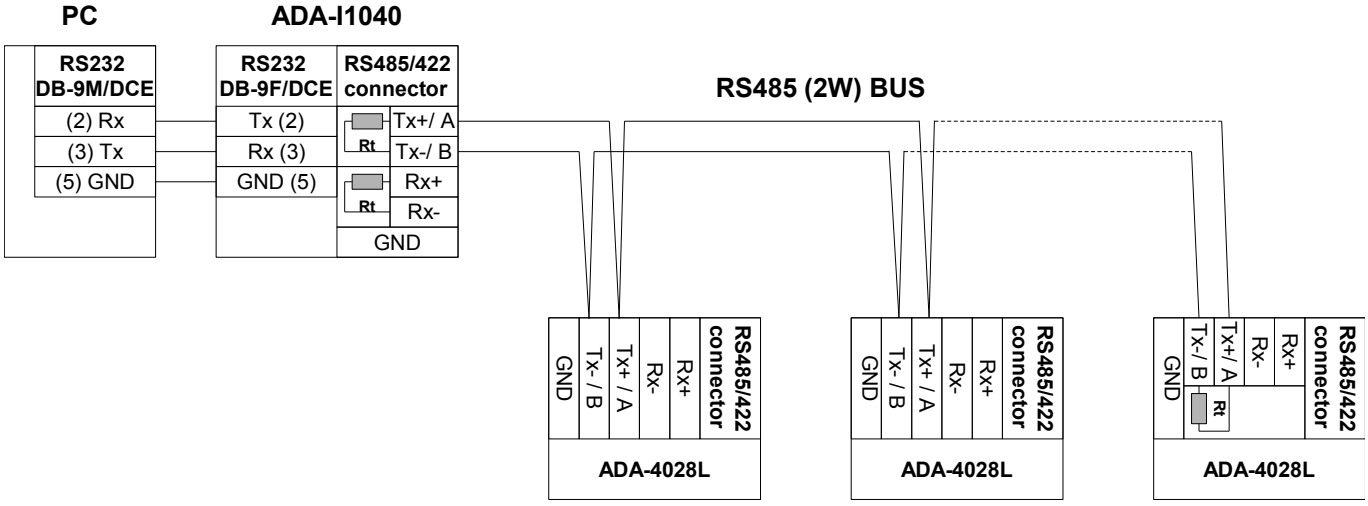

Fig 6. Example connection of ADA-4028L to RS485(2W) Bus

3.2.5. LINE TERMINATION

The application of Line Termination (terminator) Rt = 120 ohms will reduce electrical reflection in data line at high baud rate. It is not needed below 9600Bd. The Line Termination resistor should be used if the distance is over 1000m @ 9600Bd or 700m @ 19200Bd transmission, the resistor can be necessary if there are problems with the transmission correctness. The terminators/resistors are connected to the terminal block of ADA-4028l on the RS485/RS422 interface. Example connection of Rt are shown on Fig. 4 & 5.

3.3. CONNECTION OF CURRENT LOOP DEVICES

Current Loop CLO interface at ADA-4028L converter is available on terminal block described as: CLO+, CLO-, Rd. ADA-4028L support operating on RS422 bus and RS485 (2-wire and 4-wire). Both buses need proper cabling. Rd & CLO+ clamp is used also for connection of additional resistor for sensitivity setting of CLO receiver (see point 4.5).

3.3.1. CONNECTION ONE CLO DEVICE

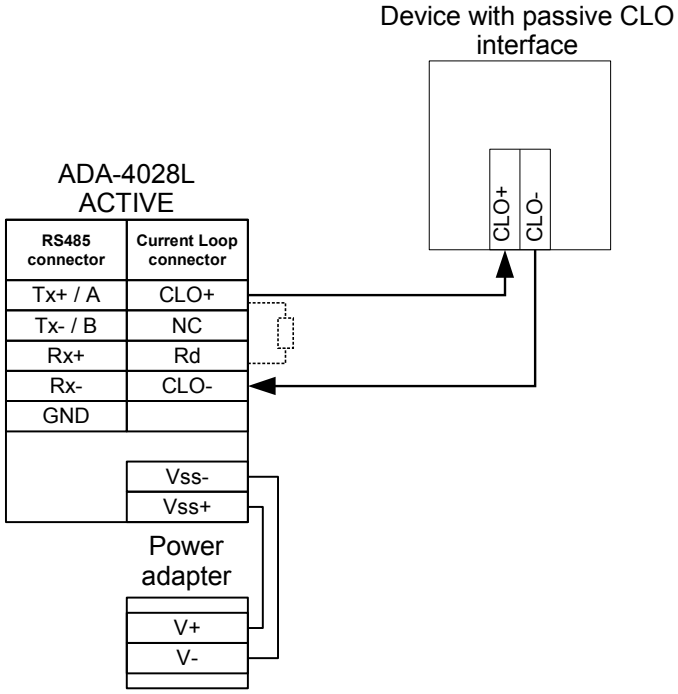

Fig 7. Example connection of device with passive CLO interface

3.3.2. CONNECTION FOUR (4) CLO DEVICES

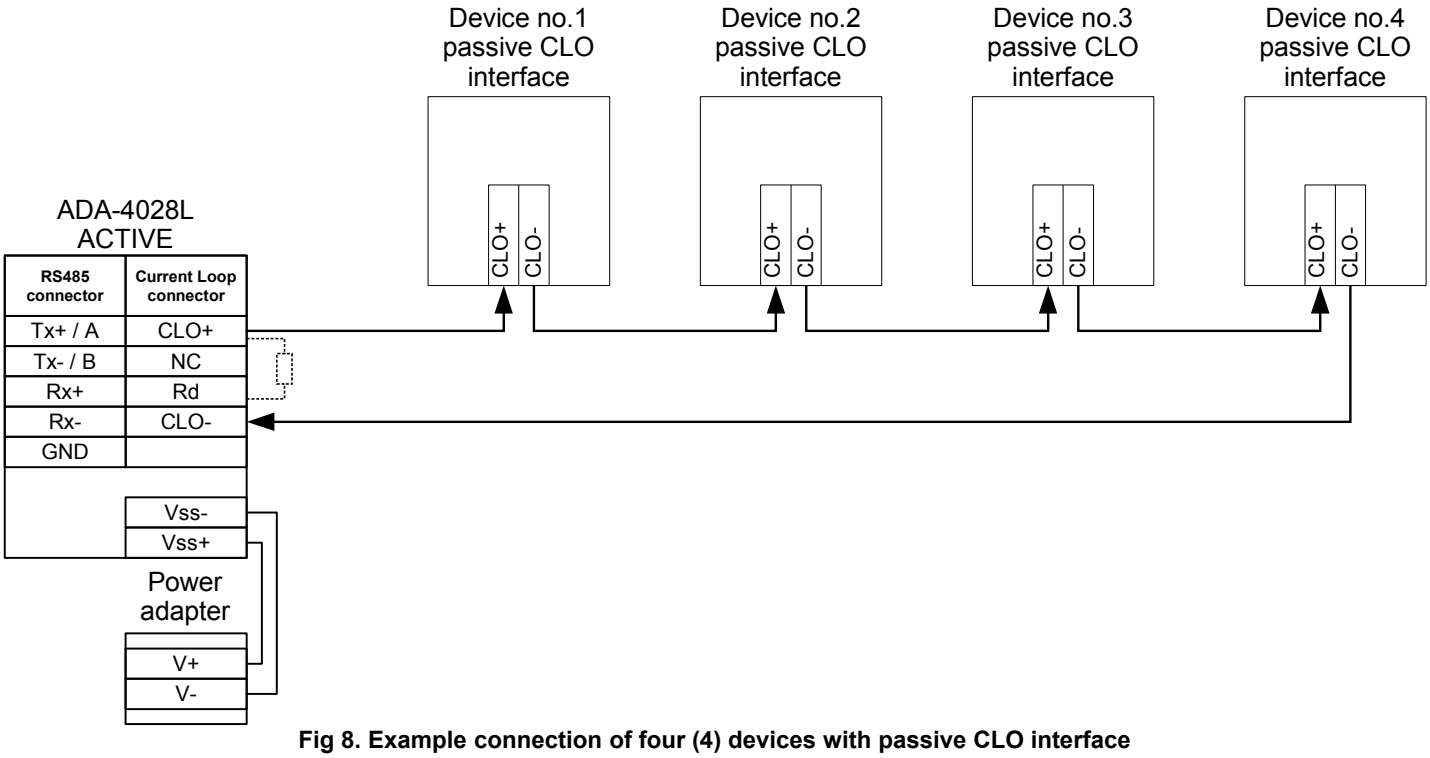

Fig 8. Example connection of four (4) devices with passive CLO interface

3.3.3. CONNECTION OF CLO ENERGY METER (LZQM)

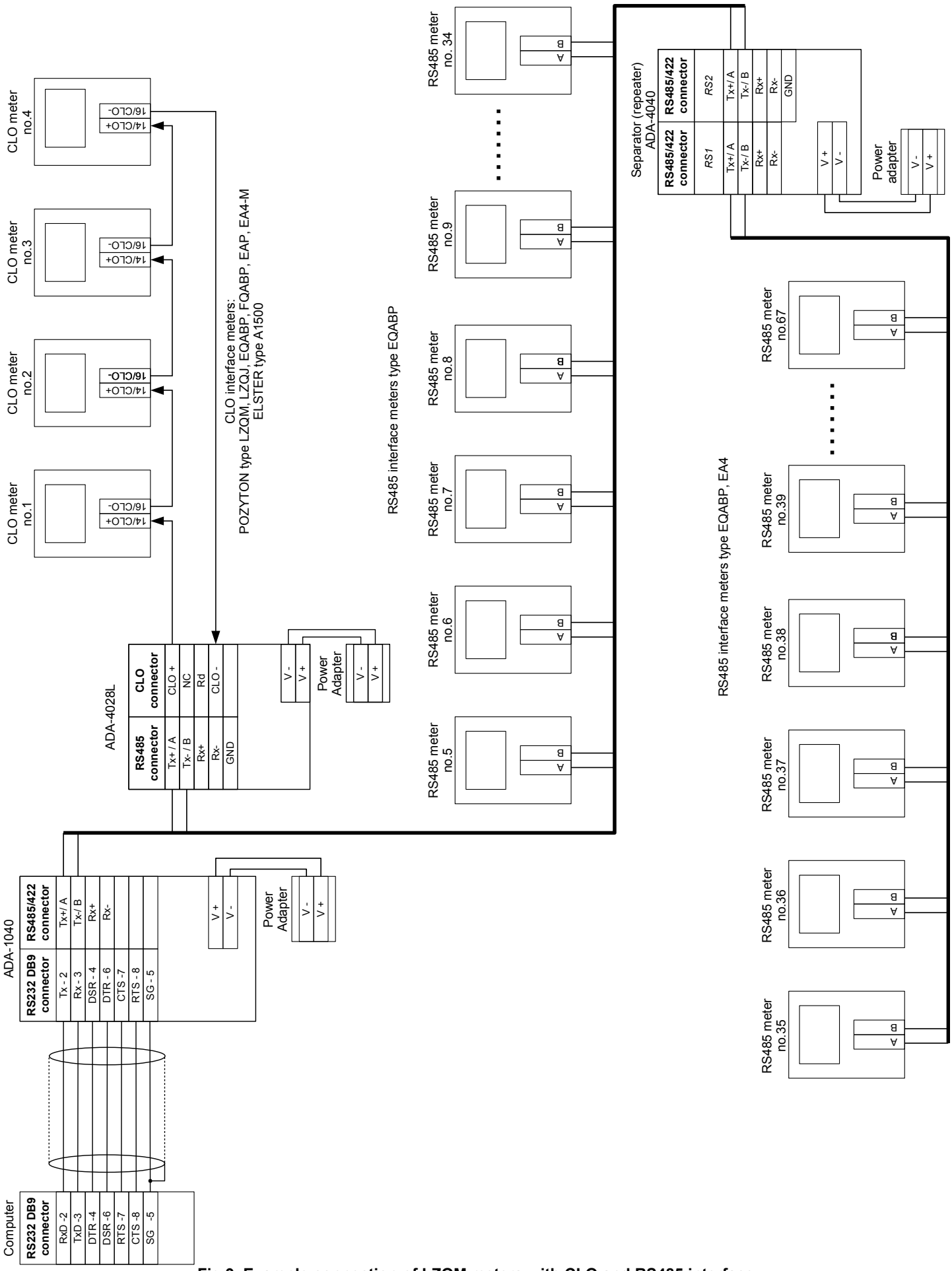

Fig 9. Example connection of LZQM meters with CLO and RS485 interface

3.4. OTHER CONNECTIONS

3.4.1. EXTENDER TYPE CONNECTION OF RS485 (2W) BUS BY THE USE ACTIVE & PASSIVE CONVERTER

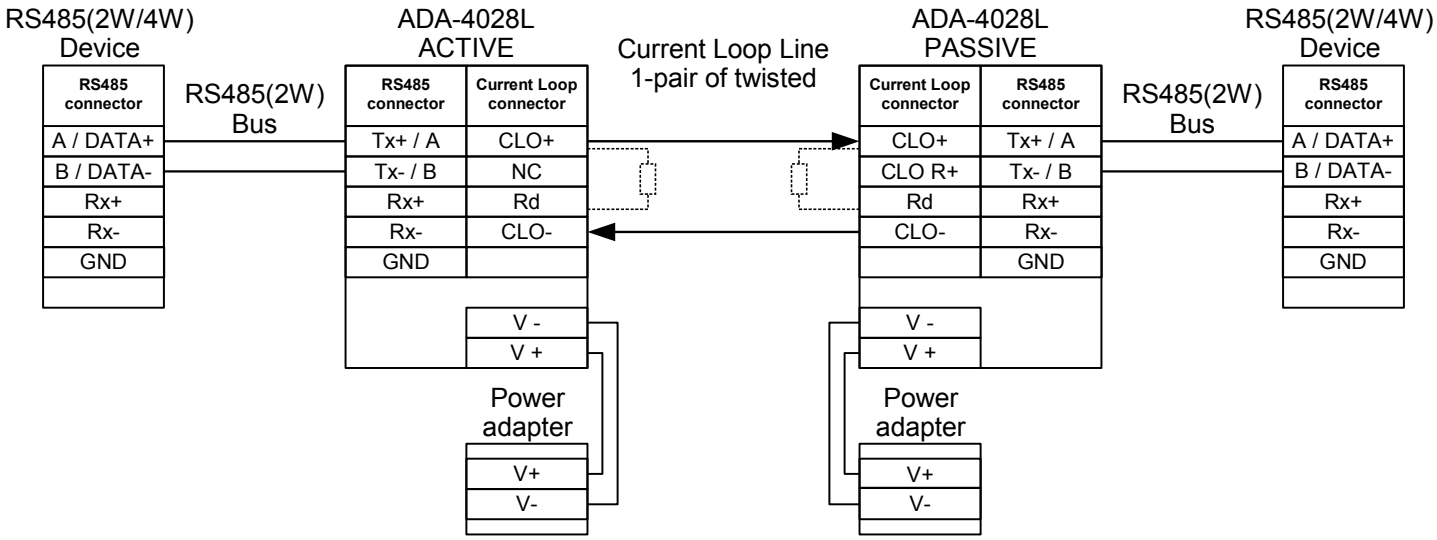

Fig 10. Example extension of RS485 (2W)

3.4.2. CONNECTION OF ACTIVE CLO DEVICE TO RS485 BUS BY THE USE PASSIVE CONVERTER

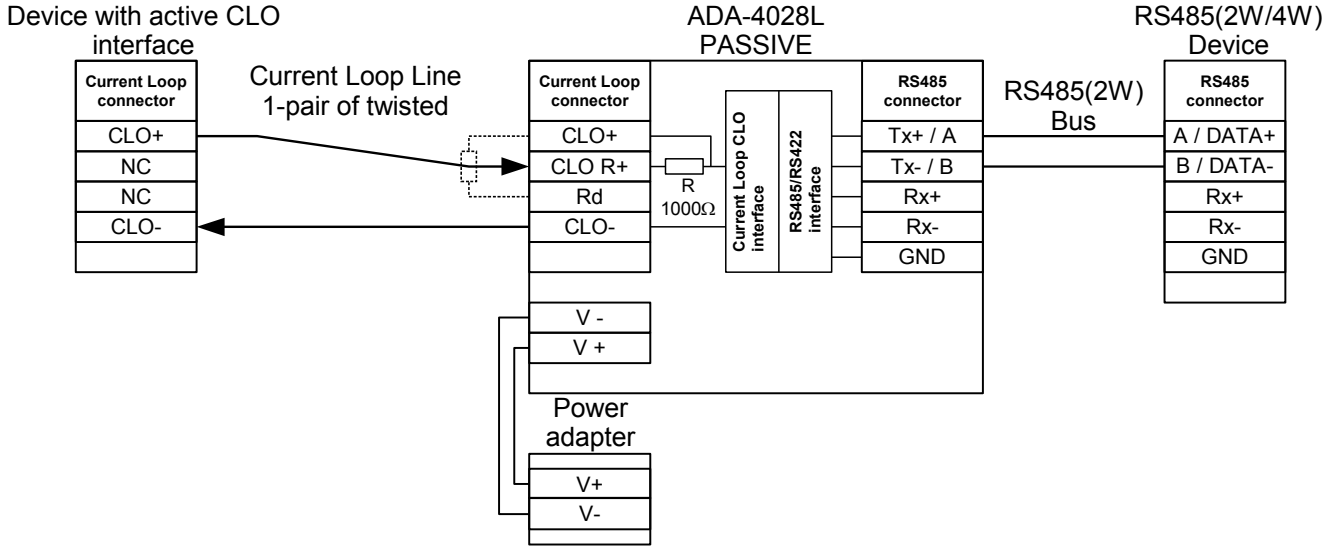

Fig 11. Example connection of active CLO device to rs485 bus

3.5. POWER SUPPLY

The power supply to ADA-4028L should be DC (regulated) from the scope 10 V= to 30V= and nominal power more then 2W. The power cable from DC power supplies to the device must not be longer than 3m. Observe the polarity, connect positive (+) of DC power supplies to V+ and negative (-) end to V- terminal. ADA-4028L has the protection from opposite connection power supply.
If after power, on the front panel is not lit green LED PWR, check the power connection (polarity).

4. CONFIGURATION

For configuration of ADA-4028L converter operating mode use a six-position dip switch SW1.
The SW1 is located next to RS485 terminal block (Fig.1) under the cover. For setting, remove the cover and use small, flat screwdriver.

4.1. OPERATING MODE SETTING

The setting of SW1 switch for operating mode of ADA-4028L is shown in the Table 1 (below).
In case of any questions, contact the support: support@cel-mar.pl.

Table 1.

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	Description	Operation mode
OFF	OFF	OFF	OFF	OFF	OFF	RS-422 Bus	RS422 bus 4-wire. Transmission full duplex or half duplex
ON	ON	ON	ON	ON	ON	RS485 Bus automatic data flow control	RS485 bus 2-wire and 4-wire. Transmission full duplex or half duplex.

4.2. FACTORY DEFAULT

During production ADA-4028L converter is configured to operating in RS485 mode as in table below.

Table 2.

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6
ON	ON	ON	ON	ON	ON

4.3. START-UP

Converter can be powered after proper connection according to steps above.
If connection was made properly green LED PWR on front panel of converter should light, if not check polarization of power connection and if RX LED is lighted check connection correctness of Current Loop transmitter circuit. When data is present the LEDs Tx and Rx should blinking.

4.4. SIGNALING LEDS

LED	*Description*
PWR	Signalling of Power Supply
RX	Signalling of data receiving through ADA- 4028L converter from Current Loop CLO port.
TX	Signalling of data transmitting from ADA- 4028L converter through Current Loop CLO port.

4.5. SENSITIVITY SETTING OF CURRENT LOOP CLO RECEIVER

Devices with a passive interface CLO may have different current values in the logical zero state, therefore should be set a converter receiver sensitivity. Wrong adjustment of receiver sensitivity is revealed by not lit of RX LED during data receiving from connected devices (energy counter) despite the correct connections to converter. A sensitivity is set by adding additional resistor to Rd and CLO+ screw terminal block. If the resistor is correct RX LED will be blinking during data receiving. ADA-4028L converter is supplied with resistors Rd = 220Ω / 0,25W and 120Ω / 0,25W.

5. VERSIONS

ADA-4028L - [ ] - [ ] - [ ]

CLO Current Loop:			
24VDC / 0-20mA, Current Loop active transmitter	**1**		
12VDC / 0-20mA Current Loop active transmitter	**2**		
24VDC / 0-30mA, Current Loop active transmitter	**3**		
12VDC / 0-30mA Current Loop active transmitter	**4**		
24VDC / 0-20mA, Current Loop passive transmitter	**1P**		
12VDC / 0-20mA Current Loop passive transmitter	**2P**		
24VDC / 0-30mA, Current Loop passive transmitter	**3P**		
12VDC / 0-30mA Current Loop passive transmitter	**4P**		
3-way Galvanic isolation:			
1kV=		**2**	
3kV=		**3**	
Terminal & Terminal Cover:			
Cover without inlets, screw terminal block			**1**
Cover with inlets, screw terminal block			**2**
Cover without inlets, plug-in screw terminal block			**3**

Order example of converter to use with electrical energy meters with current loop CLO interface:

Product Symbol: **ADA-4028L-1-2-3**

1 – 24VDC / 0-20mA, Current Loop active transmitter,
2 – galvanic isolation 1kV=,
3 – cover without inlets, plug-in screw terminal block,

6. SPECIFICATION

Transition Parameters		
	RS-485	**Current Loop**
Connector	Screw terminal, wire max. Ø 2,5mm^2	Screw terminal, wire max. Ø 2,5mm^2
Line length	Up to 1200 m	Depends on baud rate up to several hundred meters
Maximum number of connected device	Up to 32	Up to 4
Transmission line	1-pair twisted cable, UTP Nx2x0,5 (24AWG), shield inside large interferences (STP Nx2x0,5(24AWG)).	1-pair twisted cable, UTP Nx2x0,5 (24AWG), shield inside large interferences (STP Nx2x0,5(24AWG)).
Standards	EIA-485, CCITT V.11	Current Loop 0-20mA
Maximum baud rate	19,2 kbps (depend on length of Current Loop CLO line)	
Transmission type	Asynchronism half duplex or full duplex,	
Optical signalisation	• PWR – green LED power supply, • RX - red LED data receiving through Current Loop CLO, • TX - yellow LED data transmission through Current Loop CLO.	
Nominal Operating Conditions		
Power requirements	10 - 24 – 30 V DC	
Power Cable	Recommended length of power cable – up to 3m	
Power	2W	
Protection from reverse power polarization	YES	
Galvanic Isolation	1kV= or 3kV= between power circuit and RS485/422 signal line 1kV= or 3kV= between power circuit and Current Loop signal line	
Optoisolation	Min. 2,5kV - between Current Loop signal line and RS-485/422	
Operating temperature	0 ÷ +23 ÷ +50°C	
Humidity	5 ÷ 95% - non-condensing	
Position during operation	Free	
Mounting	Rail mounting according to DIN35 standard / TS35.	
Electromagnetic compatibility	Resistance to disruptions according to the standard PN-EN 55024. Emission of disruptions according to the standard PN-EN 55022.	
Safety requiring	According to the PN-EN60950 norm.	
Environment	Commercial and light industrial.	
Enclosure		
Dimensions	53mm x 90mm x 58 mm,	
Material	Noryl UL. 94 V-O	
Degree of casing protection	IP40	
Degree of terminal protection	IP20	
Weight	0,10 kg	
According to standard	DIN EN50022, DIN EN43880	
Storage and transportation conditions		
Storage temperature	-40 ÷ +70 °C	
Humidity	0 ÷ 100% - non-condensing	

Dear Customer,

Thank you for purchasing **CEL-MAR Company** products.

We hope that this user manual helped connect and start up the **ADA-4028L converter**. We also wish to inform you that we are a manufacturer of the widest selections of data communications products in the world such as: data transmission converters with interface RS232, RS485, RS422, USB, Current Loop, Fibre-Optic Converters and Ethernet or Wi-Fi.
Please contact us to tell how you like our products and how we can satisfy you present and future expectation.

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